



THE WARRIOR

Natick, Massachusetts

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***Suited
for
fire***

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Cover photo: Pfc. John Maynard models the Navy's First Attack Firesuit. (Courtesy photo)



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Evolving menu

MRE changes to match deployment conditions, warfighter wants

By Donna Miles

American Forces Press Service

Troops in the field about to grab a Meal, Ready-to-Eat combat ration might want to choose the "Jamaican pork chop," the "pasta with alfredo sauce" or the "beef with mushrooms."

These entrees will soon be gone from the MRE inventory, to be replaced by new dishes that food technologists at the U.S. Army Soldier Systems Center at Natick, Mass., say will be a bigger hit with the troops.

New this year to the MRE menu board are pot roast with vegetables, barbecue pork ribs and vegetable manicotti. New side dishes are hearty New England clam chowder and a carbohydrate-fortified applesauce.

And troops with a sweet tooth will soon be able to bite into two new cookies, one a vanilla waffle sandwich and the other, chocolate mint; peanut butter and crispy versions of M&M candies; and almond poppy seed and pumpkin pound cakes.

Janice Rosado, a food technologist for the Department of Defense Combat Feeding Directorate at Natick, said the changes are designed to maintain variety while keeping pace with warfighters' taste preferences.

"People like what's new, and we get a lot of requests for more ethnic foods and for vegetarian meals," she said.

In recent years, new MRE entrees have reflected those preferences, with several Italian, Mexican and Oriental selections offered. New in 2004 will be an entrée Rosado is convinced will be a big hit: Cajun rice with sausage. In addition, four of the 24 MRE entrees are meatless, she said.

That doesn't mean that some of the perennial favorites, like spaghetti and beef stew, are going to go by the wayside, Rosado said. Both have remained on the MRE menu list since the pouched combat rations

were first widely introduced in the early 1980s.

"We try to keep a combination of items that remain popular along with new items that keep the selection interesting," she said.

During the past decade, Rosado said Natick engineers have introduced sweeping changes to MREs. They've added a flameless heater to all meals so they no longer have to be eaten cold or soaked in tubs of hot water, doubled the number of entrees so troops deployed for extended periods don't grow weary of limited selections, and replaced most freeze-dried fruits with "wet pack" fruits similar to those found in a can at the local grocery store. They've also added a wide range of commercial items like candy bars and Tabasco sauce that Rosado said servicemembers are familiar with and like.

Based on successful field tests, Rosado said Natick plans to introduce two new entrees next year: Cajun rice with sausage; a veggie

griller in barbecue sauce; and a side dish, Mexican macaroni and cheese.

Also new in 2004 will be a Kremsicle cookie that tastes just like the ice cream bar served up from the truck, carrot cake (but without the cream cheese icing), and red hot candies.

And because MREs generally take about two-and-a-half years to develop, test and get approved, Rosado said she already knows what's on the radar screen as far out as 2005.

In 2005, she said to look for chicken fajitas with tortillas, a cheese omelet with vegetables, penne with spicy tomato sauce, and sloppy joes. Also to be introduced are hash browns with bacon and a blueberry-cherry cobbler that's chock-full of fruit.

"It's a never-ending process here to develop and field the very best combat rations possible," Rosado said. "We listen closely to what the warfighters tell us they want, and we do our best to give it to them."

MRE in's and out's

2004

2005

In

R&D items

Veggie griller with barbecue sauce, Mexican macaroni and cheese

Non-developmental items

Cajun rice with sausage, refried beans, cheese spread with bacon, carrot cake, molasses cookie, toffee crunch cookie, Kremsicle cookie, dried cranberries, dried cherries, red hot cinnamon candies, peanut M&Ms

Out

Bean and rice burrito, turkey breast with potatoes, buttered noodles

In

R&D items

Penne with spicy tomato sauce, sloppy joe filling

Non-developmental items

Chicken fajita, cheese omelet with vegetables, tortillas, hash browns with bacon, smokehouse almonds, Ranger bar, cheese nips, raisins, white chocolate/raspberry cookie, cinnamon scone, blueberry-cherry cobbler, Sports Day beverages, jalapeno ketchup, steak sauce

Out

Pasta with vegetables in tomato sauce, Thai chicken, country captain chicken, beef teriyaki

Modernized manikin

Uncle Wiggly resumes thermal testing after major 'organ' replacement

By Curt Biberdorf
Editor

Uncle Wiggly, the 20-year-old articulated thermal manikin at the U.S. Army Research Institute of Environmental Medicine (USARIEM), has new life after a major component upgrade during the past year was completed in February.

The manikin's original copper-plated shell, cast aluminum joints, heaters and sensors remain, but a thermal control system consisting of signal conditioning, heater drivers and computer software, and a computer-controlled sweating system were installed by Measurement Technology Northwest in Seattle, Wash., into the existing body to create a product unlike any other.

"It's really amazing. You don't realize it until you see (other thermal manikins)," said Julio Gonzalez, a research scientist in USARIEM's Biophysics and Biomedical Modeling Division at the U.S. Army Soldier Systems Center in Natick, Mass. "With the unique way it's built and operates, I don't think they'll make another one like this."

Researchers have used thermal manikins to measure thermal and water vapor resistance values of clothing since the 1940s to help improve functional performance and thermal comfort. The values are also incorporated into practical human performance models by the division to predict work/rest cycles, maximum work times and water consumption requirements, according to Gonzalez.

"It all started as a way to predict Soldier performance in the field," he said. "The modeling results then can tell how long personnel can safely operate in certain environmental conditions."

USARIEM started using Uncle Wiggly in 1984 during a push in the 1980s by the Army to completely redesign military clothing systems using a variety of new technologies and materials, such as Gore-Tex and



Courtesy photo

USARIEM's revamped articulated thermal manikin called "Uncle Wiggly" rests in its own climate-controlled test chamber ready to measure thermal and vapor resistance values of clothing ensembles.

Thinsulate.

The manikin has 19 individual heating zones and swings its arms and legs to simulate walking at speeds up to 3 mph. Testing is conducted in its own chamber controlled for temperature, humidity and wind speed provided by a fan.

Still functional, the original manikin had become increasingly difficult to operate with slow computer processing power and parts that were wearing out. All data was printed out and then entered by hand into a com-

puter to calculate wet and dry insulation values of various prototype military uniform ensembles. If testing wasn't closely monitored, previous measurements could be lost, and results were difficult to repeat.

"Now we're able to collect data in real time on a Windows-based computer, and all the data is saved automatically. I can open the file later to analyze the numbers," Gonzalez said.

Measuring dry insulation values was demanding, but measuring wa-

ter vapor transfer through the clothing was worse.

Before the upgrades, he had to simulate sweating of the manikin by applying water to an all-cotton layer "artificial skin" without getting the actual test clothing wet.

"You had to undress the manikin, spray the cotton skin with water, then quickly re-dress it and pray that it didn't dry too soon," Gonzalez said.

The upgraded Uncle Wiggly sweats automatically through a series of valves and hoses that pump water through dozens of "weep holes" drilled through the metal. They provide even and adjustable water distribution along the 19 sections, which are still independently heated.

One power supply replaces 19 power supplies. Each zone has its own easily replaceable plug-and-play microcontroller to oversee temperature and fluid control and measurement. Measurement updates are shown every second instead of every 20 seconds.

Measurement Technology Northwest's computer software uses color-coded manikin pictorial displays, selectable for any manikin variable. It provides automatic steady-state detection, helpful in identifying the desired manikin temperature.

The operator can also program a work cycle simulation, and view an

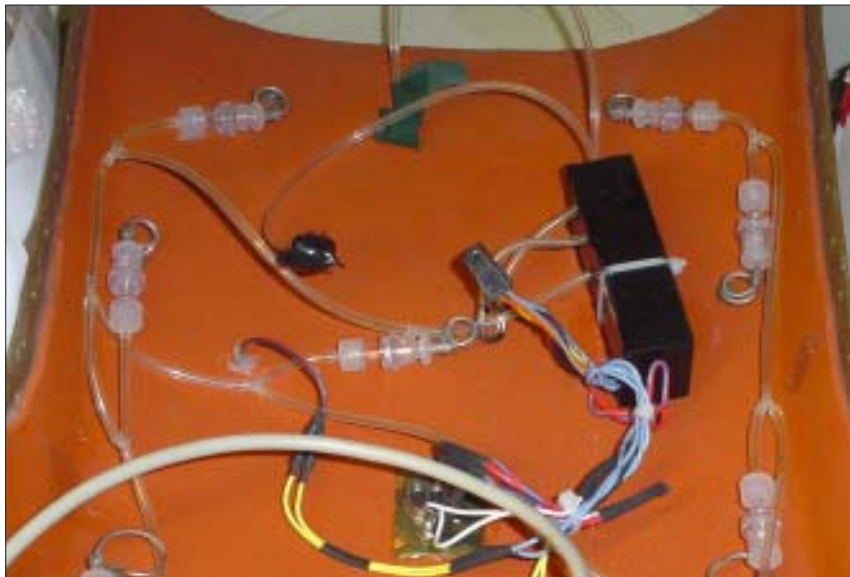
instantaneous bar graph and time history line graph for any selected manikin variable.

"I can take just a small portion of the graph, zoom in on a selected time period, and then get a good high and low point to get a good average measurement," he said. "You can tell the (thermal resistance) value in a specific region on the manikin or part of the clothing and even add or subtract a piece of clothing without having to rerun the entire test."

Microclimate cooling vests are

easily tested now because the manikin automatically calculates the number of watts of heat removed with the garment.

Gonzalez said the new capabilities will enable him to cut testing time in half. He conducted his first comparative test with the improved manikin wearing a Temperate Battle Dress Uniform. Calibrated and validated against the old system, he and Uncle Wiggly are ready to resume testing for the next generation of uniforms.



The inside of the chest cover (above) and chest cavity of the manikin show its new components, including a series of valves and hoses that pump water through dozens of "weep holes" drilled through the metal used to simulate sweating. (Courtesy photos)



A new generation of Navy ships manned with fewer sailors means fewer firefighters. However, anyone aboard will be able to respond within seconds dressed in the...

First Attack Firesuit

By Curt Biberdorf

Tucked into its own pocket, the First Attack Firesuit resembles a dark-colored pillow until one seam is opened to unfold a coverall-style uniform donned in about one minute to protect sailors responding to shipboard fires.

The new firesuit, developed by the U.S. Navy Clothing and Textile Research Facility located at the U.S. Army Soldier Systems Center in Natick, Mass., was driven by reduced manpower requirements for the Navy's next-generation DD(X) family of ships.

With about one-third of the manning of current ships, the Navy can't afford to have as many dedicated firefighters and will need more sailors to assist in putting out fires, said Harry Winer, a textile technologist and project officer for the First Attack Firesuit.

"The concept (of the new firesuit) is to get to the fire at an early stage and expect the damage and loss to be less because of speedy deployment of the suit," he said. "We plan on hanging the suit anywhere along the ship so that any sailor can use it. We expect every sailor to be able to be a firefighter."

By contrast, the standard firesuit is now stored in three rooms aboard the ship.

When the alarm is sounded, firefighters head to the fire locker to get dressed and then move to the fire, which by then may have grown much larger, according to Winer. The new firesuit will allow the nearest sailor to don the suit and put out the fire.

The capability is assisted by the



Courtesy photo

The First Attack Firesuit stores into a pillow-sized package. Loops are available to hang the firesuit at various locations around a ship, which shortens critical response time to contain the fire.

new firesuit's two sizes instead of the standard firesuit's 18 sizes. Winer estimated that 75 percent of the population will fit into the smaller size with the rest fitting into the larger size. Velcro fasteners around the waist adjust leg height for a better fit.

Once removed from the pocket bag, sailors simply pull the new firesuit over their heads and close the zipper that starts at one ankle, follows an arc peaking along the stomach and then stops at the other

ankle.

The suit material is composed of a filament slick liner to slide more easily over clothing, an intermediate barrier and outer shell of the latest fire-resistant fabrics.

It comes with an attached instead of separate hood, attached thumb wristlets and a back cargo pocket. Loops for hanging the suit are stitched onto the bag, and gloves are included separately.

Compared to the standard suit, the new firesuit is expected to cost 40

percent less and weighs 5 pounds instead of 8.5 pounds.

Flame and heat protection of the material is slightly lower, but in reality, the difference is negligible, according to Winer.

"It's almost like a big sack pulled over you. That gives you a lot of trapped air good for insulation from the fire and heat," he said. "It's best if it's a loose suit. The old suit is a form-fitting garment and can't be packed up."

A coverall-style of firesuit is desirable because the clothing is less likely to get caught in the confined spaces shipboard, and it restricts hot air and gases that might enter with a two-piece garment, he said.

Two different dark-colored pockets will be used to indicate the two sizes, and the firesuit will be labeled with reflective lettering that glows in the dark to aid visibility if the lights go out.

Firefighters aboard a fire research ship evaluated the new firesuits last year, and designers are preparing for the final laboratory demonstration with instrumented thermal manikins and another demonstration on the fire research ship as soon as this spring.

Winer said everyone preferred the First Attack Firesuit to the standard firesuit. The lower weight contributes to improved comfort, which reduces the amount of stress on firefighters. Although designers wanted the least amount of frills, firefighters got the cargo pocket upon request.

"In testing, the firefighters said they felt no heat. One guy let fire hit him in the chest," he said.

Initial fielding is expected to begin in about a year aboard today's ships.

One technology that might be adopted is reflectivity built into the outer-shell fabric to replace reflective stripes attached along the arms, legs and torso.

Winer said the fold-into-its-own-pocket design, unique for any piece of protective clothing, draws initial disbelief, but it soon wins over any naysayers.

"When you first see it, you go 'Oh no,' but when you wear it, you fall in love with it. Firefighters fall in love with that suit," Winer said.



Courtesy photo

Once unfolded and slipped over a sailor's uniform, the next step is to zip it closed following an arc from one ankle to the other. Total donning time is about 60 seconds.

Zapped food

Microwave sterilization kills bacteria while retaining high quality

By Curt Biberdorf
Editor

Microwave energy, long used in homes to cook or reheat food, is gaining momentum in the United States as a method for processing more palatable shelf-stable foods for the military and commercial market.

Already successfully used overseas as an alternative to frozen or refrigerated packaged foods, a partnership between the Department of Defense Combat Feeding Directorate at the Soldier Systems Center in Natick, Mass.; Washington State University (WSU) in Pullman, Wash.; and several food processing, equipment and packaging companies to process food through a microwave sterilization system is moving ahead with a fresh influx of federal and private sector funding.

The microwave sterilization project commenced in 2000 under

the federal government's Dual Use Science and Technology program with Kraft Foods Inc., Hormel Foods and Truitt Brothers Inc., a food processing company, along with packaging and equipment companies Rexam Containers, Graphic Packaging and Ferrite Components. Since then, Ocean Beauty Seafoods Inc. and Mars Inc. have joined the effort to raise the quality of processed Alaska salmon and other traditionally-processed products.

Designed and located at WSU, the pilot-scale microwave system has demonstrated the capability, and will now be able to take the next step of creating a pre-production plant for a larger-scale operation to conduct research for military and commercial foods, study shelf life, and work on gaining approval from the Food and Drug Administration (FDA).

Unlike home microwave ovens, the microwave sterilization system

is high-powered and treats pre-packaged food submerged in water, allowing the microwaves to penetrate the food and uniformly cook packaged foods from the inside out, preventing burning around the edges. Sealed in its package before cooking, the idea is to kill all bacteria in the food quickly without damaging its texture or flavor.

"We're talking about a quantum leap in food quality," said Tom Yang, a senior food technologist at the Combat Feeding Directorate, comparing it to conventional retort processing, currently used for the Meal, Ready-to-Eat (MRE) entrees, tray rations and in canned commercial foods.

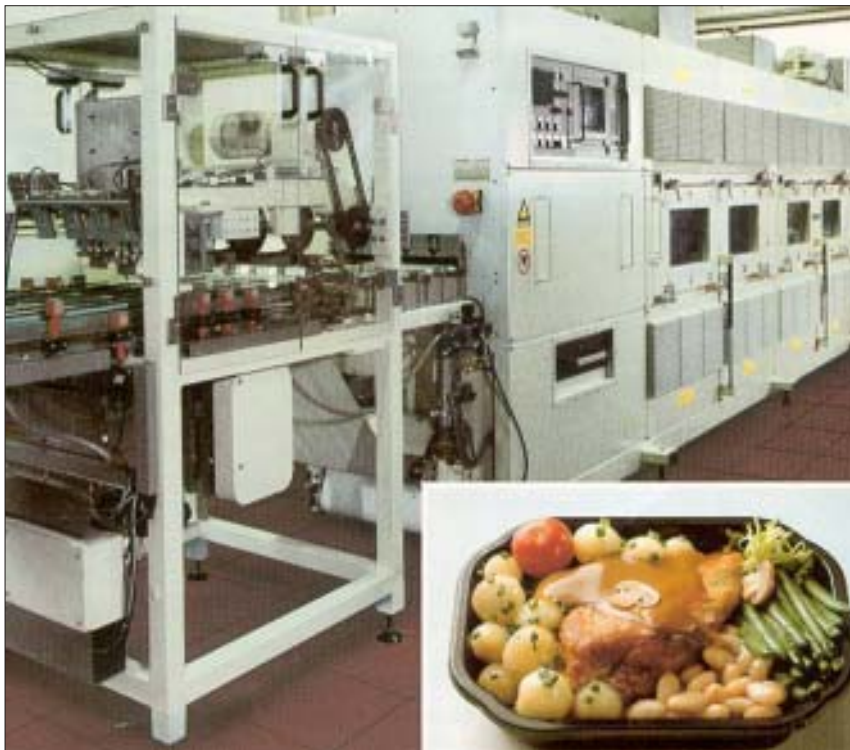
Microwave sterilization is a high-temperature, short duration form of processing. Instead of retort's 250 degrees F for 90 minutes, the microwave cooks at 265 degrees F in 10 minutes.

"We can introduce more variety of foods to warfighters," he said, while improving products that are currently fielded. "We'll be able to introduce a lot of products that we can't do with retorting. The MRE menu of 24 different entrees is continually being improved to keep only the best items."

Certain foods were out of the question until microwave sterilization.

"A challenge to us is to have a whole muscle product that looks and tastes like a freshly broiled fillet," said Patrick Dunne, senior technical advisor at the Combat Feeding Directorate. "With retorting, it often ends up being tough and overcooked to make sure all the bacteria has been killed. We also see this technology as doing a really great job with seafood and other products, such as macaroni and cheese, scrambled eggs and mashed potatoes."

Besides quicker processing and improved quality, other advantages of microwave sterilization are preserving nutritional benefits that are



Courtesy photo

A commercial microwave sterilization system in Europe is set up to continuously process packaged foods for consumers.

degraded during retort, and less need for freezers or refrigerators in the field, according to Yang.

First developed in the 1990s at WSU and led by Juming Tang, a professor in the Department of Biological Systems Engineering, food technologists at Combat Feeding contributed to the project by helping solve the problems of uneven heating and monitoring of heat distribution, and providing technical advice on quality and sensory evaluation. The companies are bringing their expertise in marketing to reach out to consumers with products they want, said Yang.

“We can tailor the energy distribution appropriate to each different food in a tray to have the ultimate quality,” Yang said.

Although promising, the technology still has some challenges to overcome.

Formulation and preparation by culinary specialists before microwaving is still as important as ever, according to Dunne, or the product quality will suffer. He also said that the food industry, a conservative high-volume, low-profit-margin sector, will need to be convinced that the technology is worthwhile before making the financial investment.



Salmon still in its packaging (above) and chicken breast taken out and put on a plate are two foods that are good candidates for microwave sterilization because retort processing often ends up overcooking meat in order to kill all bacteria. (Courtesy photos)



Courtesy photo

This packaged pasta and sauce meal sold in Europe is one example of the microwave-processed foods widely available in other countries.

“You have to demonstrate a huge advantage or they’re not going to buy into it,” Dunne said.

The microwave sterilization system now has the capacity to cook foods in small batches, but the plan is to transition to a “semi-continuous” process in another year and eventually a continuous process where food packages move out non-stop as is done now in many other countries, according to Yang.

Pending FDA approval and selection of a suitable packaging system, Yang said microwave processing would begin to supplement some retort-processed military rations.

For industry, a marketing campaign may be necessary to convince consumers of its appeal over conventionally-processed foods and quite possibly over the perceived freshness of widely-available frozen or refrigerated foods.



Getting green

Civilian recounts field experience with mechanized infantry

By Rock Woodstock
Contributing Writer

During the course of a business day, I receive many e-mail messages as a contracting officer with U.S. Army Tank-automotive and Armaments Command-Rock Island (TACOM-RI). Most messages deal with routine issues, however one recent message was a bit unusual. It sought applicants for something called the "TACOM Greening Program."

The program, sponsored by the TACOM Learning Center and executed by the Natick Soldier Center's (NSC) Operational Forces Interface Group (OFIG), offers selected individuals the opportunity for an all-expense-paid, mid-winter trip to Fort Riley, Kan., to observe an Army unit training in the field.

All that was required was the ability to march three miles with full pack, a short biography, and a brief written statement about why I wanted to go and what I expected to learn from the trip.

A few weeks later, I was surprised to learn I was selected along with four other TACOM employees to participate as embedded observers with a mechanized infantry battalion conducting live-fire exercises during the last week of January 2004.

OFIG would provide all the per-

sonal equipment that we would need from head to toe, using the same battle-tested gear used by today's Army worldwide.

The NSC also provided two Soldiers to prepare us for the field and guide us through the experience. Our initial contact was Sgt. 1st Class Sam Newland, the noncommissioned officer-in-charge of the Greening Program.

My fellow travelers were Karen Hackett, a specialist in chemical defensive equipment, and Van Lopez, a technical writer supporting the Bradley vehicle fleet. The other two participants, Merlin Osborn, a range target specialist from TACOM-RI, and Jeff Robertson, an engineer from Anniston Army Depot, would meet us later in the trip.

Gearing up

Sgt. 1st Class Newland greeted us after we landed at the airport in Manhattan, Kan. The jump wings on his chest and Ranger tab on his shoulder indicated that he was well-versed in combat arts. His steady gaze and firm handshake inspired confidence as we introduced ourselves.

After arrival at Fort Riley, Sam explained the events to come for the next few days. We then went for dinner where he answered our questions and got to know our group. He said that while we were there to

learn the host unit's mission, our presence gave the unit the opportunity to experience operations with embedded civilian noncombatants.

Sunday morning brought wind, snow and colder temperatures. Our group went to the headquarters of the 1st Battalion, 41st Infantry, 1st Armored Division (1-41).

Sam led us into the auditorium at battalion headquarters and issued each person a large heavy canvas bag, a backpack with frame and a pair of the heaviest boots I had ever seen. We opened our bags and spread ponchos on the floor. Then we placed the contents of the bag on the poncho and conducted an equipment inventory to accept responsibility for the Army property we would use for the next week.

The gear included uniforms, extreme weather clothing and accessories, helmet, sleeping bag and body armor. Sam answered our questions and guided us in the process of converting the one-size-fits-most equipment into gear correctly sized for each of us.

Then we put on our body armor and loaded the remaining equipment into the backpacks and tried it all on for the first time. Between the bulletproof vest and the pack, the total load was about 60 pounds. I felt like a slow-moving target as I lumbered out of the building with my heavy load of personal equipment.

Show and tell

Our group reassembled at 5:30 a.m. the next day, our start delayed by an ice storm the previous night. The delay gave us a chance to play cards and enjoy a Meal, Ready-to-Eat (MRE) for lunch. Some MREs are tasty, and some are not. Every Soldier has his preferences and often barter meal components to customize his diet.

Eventually, two companies of our host battalion assembled and we headed out to the training facility. Upon arrival, our group settled into large open bay barracks and met



Courtesy photo

Rock Woodstock poses in front of the 1st Battalion, 41st Infantry, headquarters building in Fort Riley, Kan.

with our assigned infantry squads. The young men introduced themselves, identified their assignments and demonstrated their weapons. Assault rifles and machine guns are the tools of their trade.

Each soldier took great pride in demonstrating the features of their gear and allowed members of our visiting group to try on their equipment. The combination of night vision goggles and infrared lasers was impressive. Selecting targets and aiming the laser-enhanced weapons in complete darkness was second nature to our hosts, providing a vital advantage during combat.

Gunnery

After dinner, the senior NCOs conducted a briefing that covered the objectives of our training exercise.

My squad was assigned the task of heading the assault to protect the flank of the main attack. We were to engage and destroy the enemy. Upon contact we expected that the enemy would disengage from the fight because of our technical superiority.

If necessary, we were to pursue and deny the enemy the use of the village to regroup and reorganize. Intelligence estimates also indicated that we could expect the enemy to use their chemical weapons in the event that the tide of the battle turned against them.

The following day the skies cleared and the wind picked up, putting our extreme weather gear to the test. The Extreme Cold Weather System garments were very effective and proved invaluable during our time at the Fort Riley range.

Our Bradley Fighting Vehicles (BFVs) started in a haze of diesel fumes as they warmed up in the sub-zero cold. We left the motor pool for the firing range and a practice run of the assault.

The actual live-fire exercise would be conducted by day and at night with night vision goggles. In the interest of safety, our group would take part only in the daytime activities and later watch the night-fire from the range control tower.

Every Soldier we talked to was impressed with the 25mm Bushmaster cannon and how effective it was in urban warfare.



Courtesy photo

Greening participants along with Sgt. 1st Class Sam Newland (third from right) stand in front of a Bradley Fighting Vehicle before observing a live-fire exercise.

Throughout our visit, we explained to our host unit our role as support and provisioning civilians. We discussed TACOM's mission and the equipment development and fielding process. We listened to and noted individual Soldier concerns and issues regarding equipment design, configuration and condition.

Examination of the vehicles and personal weapons used by 1-41 illustrated the wide disparity in the condition and configuration of equipment in fielded units. Many troops are doing more with less, yet they are being tasked with the same missions as better-equipped units. The close interaction with the host unit gave our team the chance to identify new or unmet equipment requirements.

Information exchange

Sam and Staff Sgt. Raul Lopez, enlisted liaison at OFIG, documented individual equipment issues for discussion back at the NSC. The host unit welcomed the chance to discuss these issues.

Our team also used Soldier discussions to promote Web-based TACOM support available to Army customers. This line of communication is limited by the fact that not all Soldiers have laptop computers and only limited access to command-sponsored computer centers. We established new lines of communication using Army Knowledge Online, an Internet-based forum used by the Army, to follow up on issues identified during discussions.

After a good night's rest and a remarkably satisfying breakfast at the field dining facility, my squad gathered its equipment, loaded up their BFVs and headed to the range for the daytime live-fire exercise.

Even with ear plugs, the sound of the 25mm Bushmaster inside the Bradley is best described as that of a sledgehammer pounding the side of the vehicle hull next to your head. It indicated that we were engaging enemy vehicle targets.

Our assault was a coordinated action with the other squads as we alternately advanced and provided cover for other units. We arrived at the village, a target complex identified by hay bales and mock ruins, and engaged the enemy.

The following morning we thanked our hosts for the experience of a lifetime and returned to our rooms on post. We washed and sorted our personal equipment, returned the loaned gear to Staff Sgt. Lopez and reverted back to our civilian alter egos. Fantasy camp was over; it was time to go home.

Editor's Note: The Natick Soldier Center Greening Program initially involved only Soldier Systems Center employees but has expanded its reach to Tank-armaments and Automotive Command, Edgewood Chemical and Biological Center and other elements within the Research, Development and Engineering Command.

To find out more, contact the Operational Forces Interface Group at ofig@natick.army.mil.



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